

E591 Climate-Change Impacts on Natural Resources – Fall 2024

Vicky Meretsky

Class time: T, Th 1:15-2:30

Location: PV 163 (O'Neill building, bottom floor near the food court)

Office hours (Zoom link <https://iu.zoom.us/j/82593224158>) : Tuesday 2:30-3:30 pm in A321 or phone or Zoom, Wednesday 8:30-9:30 pm Zoom or phone only, Thursday 10 am-11 am Zoom or phone only.

Please use <https://calendly.com/meretsky/ccinr24-office-hours> to reserve office hour time if you know you will need it in advance. Drop-ins also welcome, but you will have to wait if someone has reserved time.

Class Zoom - <https://iu.zoom.us/s/81843574002>

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Course design

This advanced graduate course is intended for students with background in the supporting disciplines of ecology, conservation biology, agricultural ecology, energy and climate change, water resources, natural resource management, and relevant environmental policy. The prerequisites seek to ensure that everyone can bring information to our discussions.

Course material is at the intersection of several O'Neill fields; the course is accepted in many concentrations. If you want to use the course in a concentration for which it is not presently listed, please talk to an advisor about making a substitution.

This is a discussion-based class with significant responsibility resting with the participants. We will spend the first two weeks developing a common foundation for the rest of the semester. Thereafter, material will include required and optional topics, but even within required topics, student discussion leaders will be able to select readings to take the topic in the direction of their choice. Broadly, topics will include

- climate-change impacts to species and ecosystems, and management and policy to address these,
- climate-change impacts to water and soil, and management and policy to address these. Impacts to and from agriculture and to food security and related management and policy,
- Impacts to species, ecosystems, water, and soil from energy systems especially renewable energy sources such as biofuels, wind, and solar, and related management and policy,
- and tools, particularly analytical and modeling tools, for assessing and affecting climate-change impacts to natural resources.

Professional practitioners and researchers may cover some topics as guest lecturers.

We will combine group discussion with individual work to get the best of both worlds. Students will develop skills in leading and facilitating discussion, summarizing complex ideas cogently and concisely, synthesizing relevant research in a variety of formats and communicating with a variety of audiences. I will use some testing to assure that desirable content-based learning outcomes are being met, but the majority of the grade will come from other aspects of the course.

Learning Outcomes/Objectives

Students will become familiar with

- major scientific findings concerning direct and indirect climate-change impacts on species, ecosystems, ecosystem processes, soil, and water;
- implications of climate-change impacts on natural resources on human communities;
- options for managing natural resources under climate change including strategies to facilitate adaptation;
- policy mechanisms related to climate-change impacts on natural resources; and
- common tools associated with science of climate-change impacts on natural resources and with management of natural resources under climate change.

Students will improve their abilities and comfort with

- critical thinking,
- writing for professional and public audiences,
- editing writing for structure and clarity,
- identifying major lessons in primary literature,
- synthesizing concepts across disciplines to solve problems related to climate-change impacts on natural resources,
- leading, facilitating, and participating in group discussions,
- evaluating contributions of peers, and
- current uses and limitations of AI in finding and presenting information.

Course content

I will lead readings discussions for the four classes after the first meeting. We will review the summaries for policy makers of the reports of the three working groups of the Intergovernmental Panel on Climate Change as well as the National Climate Assessment and similar documents that provide a thorough introduction, accessible to all. We will finish with a discussion of planetary boundaries and the contribution of climate change to pushing the planet past livable conditions. This initial review will be extensive but basic, ensuring everyone has a good foundation for the class.

After the first 5 classes, the schedule is general and somewhat fluid. I will require some topics within each of the blocks three main blocks (species and ecosystems, water and soil, energy ripple effects). Some of those I will cover, others student teams will cover. But also, within each block, some student teams will pick topics that reflect their interests.

Classes of 27 Aug – 10 Sep (5 classes) – Intro, Summary review of climate-change impacts on natural resources from IPCC reports, the US National Climate Assessment, planetary boundaries. Meretsky leads all classes.

Approximately next 5 weeks – Impacts to species and ecosystems (terrestrial, freshwater, and marine) and associated management and policy. One or more tools lectures and guest lectures may also occur during this time. Typically, also I end up with the first couple of classes in this block simply because it's really early for teams to start leading.

Required topics: impacts on terrestrial, freshwater, and marine ecosystems (specifics up to student teams), range shifts of species, range shifts of ecosystems and novel ecosystems resulting from species range shifts, modeling of range shifts.
Meretsky topics: conservation under climate change, scenario planning and intro to adaptive management, managing forests under climate change.

Sample optional topics (teams may suggest others!!!): impacts on specific ecosystems or ecosystem types; ecosystems on species groups; managed relocation of species at risk from climate change, changes to fire regimes and their implications, changes to other disturbances and disturbance regimes – pests, invasive species, etc., green mitigation options (e.g., planting a trillion trees . . .), additional management of species and/or ecosystems under climate change;

Approximately next 5 weeks – Impacts to water (freshwater and marine) and soils, and associated management and policy including ag/food. One or more tools lectures and guest lectures may also occur during this time. We try to keep most of the “ecosystems” material in the previous block, and use this to look at other aspects of these topics, including water quantity and quality, sea-level rise, ocean acidification, impacts to soils, soil/water impact interactions, and, to a lesser extent, effects on food systems, populations, infrastructure, etc. But these impacts have impacts on species and ecosystems, so inevitably we have some overlap.

Required topics: impacts of sea-level rise; impacts of ocean pH (chemistry and biology), importance of coastal ecosystems under sea-level rise, including importance of sediment delivery to coastal ecosystems; impacts on water availability and water security generally; impacts of cc on soils and vice versa, changing footprint of agriculture under climate change

Meretsky topics: impacts on montane glaciers and associated impacts on rivers, water availability, etc.

Sample optional topics: interactions of soil and water impacts and implications; water quality impacts;

Approximately next 3 weeks – Impacts of energy systems, particularly renewable natural resources, and associated management and policy. One or more tools lectures and guest lectures may also occur during this time.

Required topics: biofuels and carbon debt; ecosystem impacts of biofuels; food impacts, ag and economic impacts of biofuels; environmental and ecological impacts of solar and wind energy

Sample optional topics: impacts of hydropower development, environmental and ecological impacts of geoengineering options

Grade Breakdown

Individual brief	30%
Team brief, class lead, etc.	27%
Exams (midterm & final)	24% (12% for each)
Participation	15%
Citation and writing exercises	2% (1% for each)
Editing for individual brief	2%

I am open to civil but robust discussion if these come to seem inappropriate for some reason.

Exams

We will have two exams – a midterm on the first half of the material and a final that is more heavily weighted to the second half of the material. Each exam will include some in-class work and some take-home work. The takehome portions will be out for 3-5 days.

Our final exam is schedule for Tuesday 17 December from 12:40-2:40 pm.

Important dates – submit all assignments, proposals, and exams to Canvas

Aug 30 – pairs formed to lead class discussions (and write associated brief)

Aug 31 – citation exercise due

Sep 6 – writing quiz due

Sep 8 – pair topic proposals due. Please DO NOT propose a topic you have not researched. Ensure that you have adequate literature before you propose a topic.

Sep 8 – pair class-lead date proposals due.

Oct 1 – pair informative briefs, discussion questions, and readings due for all teams that present on 3 October or later. A day or two later will be OK for teams with later class dates.

Oct 7 – topic proposal for individual brief is due

Oct 19 – learning outcomes and hook paragraph for individual brief are due

Oct 22 – in-class portion of midterm

Oct 22-26 – take-home portion of midterm (somewhat negotiable dates)

4 Nov – draft individual brief due to peer editor

9 Nov – edits on individual briefs due back to edittee

15 Nov – final brief due, with automatic extension to 24 November (if your editor agrees to the extended time frame.

Nov 25-29 – Monday-Friday of Thanksgiving week holiday

December 17 – in-class portion of final

December 15-18 – takehome portion of final (somewhat negotiable dates)

Late work

If you know you will have to turn in an assignment late, please communicate with me in some way BEFORE the due date if at all possible. I am willing to accommodate emergencies, within reason. Please bear in mind that your extracurricular activities are your responsibility - if you decide to schedule an interview during class time, you are still responsible for handing in assignments on time. Late assignments received without explanation will be downgraded 10%/day.

Class recordings

Classes will be recorded and automatically uploaded to the Canvas site. Recording will begin at the start of classes but will become useless during small-group discussion and will become more useful when we shift to full-class discussion. I will tend to edit out the small-group discussion portion of class if I have time. But not all full-class discussion will record well because not all parts of the room are picked up equally well. Because full-class discussion will be an important part of class, and because dead spots may exist, **you may not be able to rely on recordings of full-class discussion to capture all information.** If you need a class recording and do not see it in Canvas, please contact me and Mr. Salisu.

Class policy with respect to absences

Participation is 15% of the class grade, and presence (in person or by Zoom) is necessary to participate, although it is not the only aspect of the participation grade.

All students may be absent from up to two regular classes without any need for explanation. This does not include guest-lecture classes. Please be in touch with your reading group if you anticipate an absence from a regular class. You may copy me as a courtesy but do not need to do so.

In addition, absences for medical reasons and emergencies are excused. These must be reported to me, with a minimal explanation – I do not need details. If you are sick but able to attend class through Zoom, please be in touch with me as soon as possible, so I can set it up. PLEASE DON'T COME TO CLASS WITH AN ILLNESS THAT CAN BE SPREAD THROUGH NORMAL CLASS ACTIVITIES.

Keep in mind that, on exams, you are responsible for all class content, including readings, information from full-class discussion, information contributed by discussion leaders, and information contributed by me. Be sure to listen to class recordings and to get notes from colleagues if you must be absent.

Academic Integrity

You know the drill. No form of academic dishonesty will be tolerated. IU requires individual integrity and professionalism from all students. If academic dishonesty is proven, you will receive a grade of zero for the work; repeat offense is grounds for failure in the course. A website defining plagiarism, with examples of acceptable and unacceptable ways to give credit for the ideas and words of others, and a separate self-test is available in the Guides module on the course Canvas site. You are responsible for understanding the concept of plagiarism and for avoiding it at all times. Plagiarism is not acceptable in group or individual work.

Additional IU plagiarism web site: <http://www.indiana.edu/~istd/>
Self-test: <http://www.indiana.edu/~tedfrick/plagiarism/item1.html>

You will be directed to use AI for some aspects of creating your briefs, but you, not AI, must create the final products. The writing styles from AIs available to the general public do not meet our requirements.

AI assistance may not be used for tests, which must cover only information from the readings and discussions of class.

Major disruptions in your life

Some of you, for whatever reasons, may find yourselves facing more than you can easily handle during the semester. It may be something wonderful, it may be something terrible, or it may just be the grind of graduate working. Whatever the cause, such stress can make it difficult or impossible for you to focus, work, think, get out of bed, or otherwise deal normally with the semester.

Whatever may have happened, please remember that the Health Services folks have people whose primary job is helping students survive such problems, and your professors are aware that these things can happen. A Health Services advisor has office hours in O'Neill (or will, shortly after the semester starts) – you don't even need to walk across the street. Get an appointment by calling 812 855-5711 and tell them you are an O'Neill student and wish to talk with the O'Neill advisor.

I try to be flexible and helpful about disruptions, although I will want a justification (without personal details) for doing so. If the disruption continues for any substantial length of time, remember that the university allows us to grant incompletes so that students can complete work when their semesters are interrupted. But bear in mind that you must request an incomplete before your grades have gone over the edge, which means communicating with us in the midst of the chaos. More information on incompletes and late withdrawal follows.

It's easier to help if we know something is going on. Please try to be in touch as soon as you can - it makes it easier for all of us in the long run, even if it is difficult in the short run to bring yourself to talk about it. You don't owe us the details – just a message that life has become difficult or complex and some idea of what kind of timeframe you think might be involved will help us to help you best.

Incompletes. The grade of Incomplete on the final grade report indicates that the work is satisfactory as of the end of the semester but has not been completed. The grade of Incomplete may be given only when the completed portion of a student's work in the course is of passing quality. Instructors may award the grade of Incomplete upon a showing of such hardship to a student as would render it unjust to hold the student to the time limits previously fixed for the completion of his/her work.

(<http://policies.iu.edu/policies/categories/academic-faculty-students/academic-student-affairs/incompletes.shtml>)

Late Withdrawal. Withdrawal after the automatic withdrawal period requires approval by the instructor and relevant Program Director and must be based on dire circumstances relating to extended illness or equivalent distress (IU Enrollment and Student Academic Information Bulletin). Requests to drop due to a failing grade will not be approved. You must be passing the course at the time of withdrawal. Contact your advisor or the appropriate Program Director if you want to petition for late withdrawal.]

Sources for climate news:

E&E News (as long as you're at IU) <https://subscriber-politicopro-com.proxyiub.uits.iu.edu/eenews/>

Inside Climate News <https://insideclimatenews.org/>

The New York Times Climate Forward newsletter <https://www.nytimes.com/column/climate-fwd>

RealClimate <https://www.realclimate.org/>

O'Neill's own Dlist: To subscribe, send an email to SPEA-GRAD-ENERGY-I-subscribe@indiana.edu from the address that you want to receive the emails (this can also be a non-IU email address). Also posts energy-related jobs.

Journals specifically for climate science:

Nature Climate Change

Global Change Biology

Global Environmental Change

Climate Policy

Climatic Change

Note that almost all environmental journals carry climate-related articles

More general science and environmental news sites (many have newsletters to which you can subscribe)

Mongabay <https://news.mongabay.com/> (conservation-heavy)

e360 <https://e360.yale.edu/>

Environmental News Network <https://www.enn.com/>

ScienceNews [sciencenews.org](https://www.sciencenews.org)

ScienceDaily <https://www.sciencedaily.com/news/top/environment/>

Sigma Xi Smartbrief – a weekday newsfeed with about 5 science-based stories per day.

Subscribe at <https://www2.smartbrief.com/signupSystem/subscribe.action?pageSequence=1&briefName=sigmaxi>

BBC News/Science and Environment https://www.bbc.com/news/science_and_environment

New York Times/Science <https://www.nytimes.com/section/science>

Bloomberg Green <https://www.bloomberg.com/green>

O'Neill School expectations of civility and professional conduct^[1]

The O'Neill School takes matters of honesty and integrity seriously because O'Neill is the training ground for future leaders in government, civic organizations, health organizations, and other institutions charged with providing resources for the public, and for members of society who are vulnerable and who are lacking in power and status. Precisely because O'Neill graduates tend to rise to positions of power and responsibility, it is critical that the lessons of honesty and integrity are learned early.

O'Neill requires that all members of its community – students, faculty, and staff – treat others with an attitude of mutual respect both in the classroom and during all academic and nonacademic activities outside the classroom. A student is expected to show respect through behavior that promotes conditions in which all students can learn without interruption or distraction. These behaviors foster an appropriate atmosphere inside and outside the classroom:

- Students are expected to attend class regularly and to be prepared for class.
- Students must be punctual in their arrival to class and be present and attentive for the duration of the class. Eating, sleeping, reading the newspaper, doing work for another class, wandering in and out of the classroom, and packing up or leaving class early are not civil or professional behaviors.
- Students must abide by the course policy regarding use of electronic devices in the classroom.
- Students must responsibly participate in class activities and during team meetings.
- Students must address faculty members, other students, and others appropriately and with respect, whether in person, in writing, or in electronic communications.
- Students must show tolerance and respect for diverse nationalities, religions, races, sexual orientations, and physical abilities.
- Students must not destroy or deface classroom property nor leave litter in the classroom.

¹- These expectations are excerpted from the O'Neill School Honor Code which can be found at: https://oneill.indiana.edu/doc/undergraduate/ugrd_student_honorcode.pdf

Counseling and Psychological Services

For information about services offered to students by CAPS:

<http://healthcenter.indiana.edu/counseling/index.shtml>

TimelyCare

Indiana students have free, 24/7 access to virtual mental health care services with TimelyCare. Students do not need insurance to access TimelyCare services.

<https://www.iu.edu/mental-health/find-resources/timely-care.html#0>

Religious Observation

In accordance with the Office of the Dean of Faculties, any student who wishes to receive an excused absence from class must submit a request form available from the Dean of Faculties for each day to be absent. This form must be presented to the course instructor by the end of the second week of this semester. A separate form must be submitted for each day. The instructor will fill in the bottom section of the form and then return the original to the student. Information about the policy on religious observation can be found at the following website: <https://policies.iu.edu/policies/aca-59-accommodation-religious-observances/index.html>

Accessible Educational Services (formerly Disability Services for Students)

Securing accommodations for a student with disabilities is a responsibility shared by the student, the instructor, and the AES Office. For information about support services or accommodations available to students with disabilities, and for the procedures to be followed by students and instructors: <https://studentlife.indiana.edu/student-support/iub-aes/index.html>

Sexual Harassment

As your instructor, one of my responsibilities is to help create a safe learning environment on our campus. Title IX and our own Sexual Misconduct policy prohibit sexual misconduct. If you have experienced sexual misconduct, or know someone who has, the University can help.

If you are seeking help and would like to talk to someone confidentially, you can make an appointment with:

- i. The Sexual Assault Crisis Service (SACS) at 812-855-8900
- ii. Counseling and Psychological Services (CAPS) at 812-855-5711
- iii. Confidential Victim Advocates (CVA) at 812-856-2469
- iv. IU Health Center at 812-855-4011

For more information about available resources:

<http://stopsexualviolence.iu.edu/help/index.html>. It is also important to know that federal regulations and University policy require me to promptly convey any information about potential sexual misconduct known to me to our campus' Deputy Title IX Coordinator or IU's Title IX Coordinator. In that event, they will work with a small number of others on campus to ensure that appropriate measures are taken and resources are made available to the student who may

have been harmed. Protecting a student's privacy is of utmost concern, and all involved will only share information with those that need to know to ensure the University can respond and assist. I encourage you to visit <http://stopsexualviolence.iu.edu/help/index.html> to learn more.

Commitment to Diversity: Find your home and community at IU

Asian Culture Center

Address: 807 East Tenth Street, Bloomington, IN 47408

Phone: 812-856-5361

Email: acc@indiana.edu

Website: <https://asianresource.indiana.edu/index.html>

First Nations Educational & Cultural Center

Address: 712 E 8th St., Bloomington, IN 47408

Phone: 812-855-4814

Email: fnecc@indiana.edu

Website: <https://firstnations.indiana.edu/contact/index.html>

Jewish Culture Center

Address: 730 E 3rd St., Bloomington, Indiana 47401

Phone: 812-336-3824

Website: <https://iuhillel.org/iu-jewish-culture-center>

LGBTQ+ Culture Center

Address: 705 E 7th St., Bloomington, Indiana 47408

Phone: 812-855-4252

Email: glbtserv@indiana.edu

Website: <https://lgbtq.indiana.edu/contact/index.html>

La Casa Latino Culture Center

Address: 715 E 7th St., Bloomington IN, 47408

Phone: 812-855-0174

Email: lacasa@indiana.edu

Website: <https://lacasa.indiana.edu/>

Neal-Marshall Black Culture Center

Address: 275 N Jordan Ave Bloomington, Indiana 47405

Phone: 812-855-9271

Email: nmgrad@indiana.edu

Website: <https://blackculture.indiana.edu/index.html>